REMARKS

Claims 1-28 are pending. In the Office Action mailed on June 28, 2005, the Examiner took the following action: (1) objected to the drawings; (2) objected to claims 1-28 because of informalities; (3) rejected claims 13-20 under 35 U.S.C. §101; (4) rejected claims 1, 4, 5, 8, 13-21, 24, 26 under 35 U.S.C. §102(e) as being anticipated by Atkinson (U.S. 6715349); and (5) rejected claim 5 under 35 U.S.C. 103(a) as being unpatentable over Atkinson in view of Dougherty (U.S. 4258422). Applicants respectfully requests reconsideration and withdrawal of the rejections in view of the foregoing amendments and the following remarks.

I. Objection to the Drawings

The Examiner objected to the drawings on grounds that the drawings must show every feature on the invention specified in the claims, and specifically, that the following terms must be shown: fuel tank, tank geometry, sensor configuration, fuel plane intersection, and wetted volume.

Applicants submit concurrently herewith a new drawing sheet containing Figure 3 depicting a representative fuel tank embodiment as well as representative embodiments of a tank geometry, sensor configuration, fuel plane intersections, and wetted volumes. Applicants respectfully submit that Figure 3 contains no new matter as all of the aspects of Figure 3 find support in the specification as originally filed. Applicants have also amended paragraphs [0012], [0013], and [0019] to include specific references to the components shown in Figure 3.

Pursuant to MPEP 608.02 and 35 USC §113 (second sentence), Applicants further submit that the new Figure 3 is being submitted because, as noted by the Examiner, the subject matter sought to be patented admits of illustration and no drawing was submitted on filing.

For the foregoing reasons, Applicants respectfully request acceptance of the new drawing sheet containing Figure 3, and reconsideration and withdrawal of the objection to the drawings.

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II. Objection to claims 1-28 on the basis of informalities

The Examiner objected to claims 1-28 on grounds that the claims describe determining the volume of liquid present in tank when the specification discloses determining characteristics of a tank through a simulation. Applicants have amended independent claims 1, 13 and 21 to recite "*simulating* a volume of liquid within a tank during motion" to correct this informality (and therefore all claims depending therefrom). In addition, claim 21 has been amended to correct an additional informality by changing the term "vibrational" to "input." Therefore, Applicants respectfully request reconsideration and withdrawal of this objection

The Examiner further objected to claims 1-28 because in each of the independent claims 1, 13 and 21, the phrase "wetted volumes" lacks antecedent basis. Applicants have amended claims 1, 13, and 21 to recite "*one or more* wetted volumes" to correct this informality, and respectfully request reconsideration and withdrawal of these objections.

The Examiner also objected to claim 8 on grounds that the limitation "the computed errors" lacks antecedent basis. Applicants have amended claim 8 (and also claims 18 and 26) to provide the proper antecedent basis for this limitation, and respectfully request reconsideration and withdrawn of this objection.

III. Rejection of Claims 13-20 under 35 U.S.C. §101.

The Examiner rejected claims 13-20 as being directed to non-statutory subject matter under 35 U.S.C. §101. Pursuant to MPEP 2106 IV. B.1. (a), Applicants have amended claim 13 to recite "A *computer-readable medium encoded with a* computer program product", and have similarly amended claims 14-20 which depend from claim 13. Therefore, Applicants respectfully request reconsideration and withdrawal of the rejections of claims 13-20 as being directed to non-statutory subject matter.

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IV. Rejection of claims 1, 4, 8, 13, 16, 18, 21, 24, and 26 under 35 U.S.C. §102(e) as being anticipated by Atkinson (U.S. 6,75,349).

The Office Action rejected Claims 1, 4, 8, 13, 16, 18, 21, 24, and 26 as being anticipated by Atkinson. As amended, claim 1 recites a method of simulating a volume of liquid within a tank during motion, comprising receiving tank geometry information; receiving sensor configuration information; receiving tank motion information; *computing one or more fuel-plane-to-sensor intersections for at least one tank position based on the tank motion information*; *computing one or more wetted volumes, each wetted volume being computed at a fuel-plane-to-sensor intersection for each sensor location based on the sensor configuration information*; and *computing a fuel quantity at every fuel-plane-to-sensor intersection based on a sum of the one or more wetted volumes*. (emphasis added).

Atkinson (U.S. 6,715,349)

Atkinson teaches a method and system for gauging a quantity of fuel and a means for comparing outputs of probes with attitude outputs from sensor means to determine whether the probe outputs are compatible with sensed liquid attitude. (1:55-60). According to Atkinson, a system takes a height measurement from one probe and uses the attitude information to extrapolate from this the fuel height at the other probes. (2:54-3:23). If there is discrepancy indicating failure of probes, then only height measurements from functioning probes are used to calculate fuel quantity (3:24-3:30).

Atkinson does not disclose, teach, or fairly suggest the method recited in claim 1. Specifically, Atkinson fails to teach or fairly suggest a method that includes *computing one or more fuel-plane-to-sensor intersections for at least one tank position based on the tank motion information*. Since the present invention is directed to a simulation, the computed fuel-plane-to-

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sensor intersections are used to calculate predicted fuel quantity, and may also be used to compute an error at each fuel-plane-to-sensor intersection for a given sensor configuration. No comparable teaching or suggestion is present in Atkinson. Instead, Atkinson merely teaches gauging fuel quantity from *actual height readings of actual probes* (3:24-30) rather than computing fuel-plane-to-sensor intersection for at least one tank position based on the tank motion information as recited in claim 1. Accordingly, Atkinson does not anticipate claim 1.

Similarly, Atkinson also does not teach or suggest *computing one or more wetted volumes at every fuel-plane-to-sensor intersection for each sensor location based on the sensor-configuration information*. In the present invention, the wetted volume of each sensor is used to compute predicted fuel quantity by summing each of the wetted volumes associated with each sensor. In contrast, as stated above, Atkinson merely teaches measuring fuel quantity using the *height readings* of actual probes. (3:24-30).

Atkinson also fails to disclose computing a fuel quantity at every fuel-plane-to-sensor based on the sum of the wetted volumes. Instead, *Atkinson* teaches the identification of incorrectly functioning probes so that fluid gauging is only accomplished by probes that functions correctly. (2:54-3:23). Once the correct functioning probes have been identified, Atkinson then, as stated earlier, simply teaches the direct gauging of fuel quantity from the *height readings* of probes. (3:24-30).

In contrast, in order to predict the accuracy of information given by a hypothetical sensor configuration, the present invention calculates liquid quantity at every single fuel-plane-to-sensor intersection based on the sum of the wetted sensor volumes. This calculation is performed for one or more fuel-plane-to-sensor intersections in a given simulation. In other words, any computation of predicted liquid quantity in the present invention is not directly based on any fuel sensor *height reading* as in Atkinson, but based on the sum of wetted volumes of one or more sensors.

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Amended claims 13 and 21 also contain the above-referenced limitations that distinguish claim 1 over Atkinson, and are allowable over Atkinson for the same reasons as claim 1. Therefore, Atkinson does not anticipate claims 1, 13, and 21, and claims 4, 8, 16, 18, 24 and 26 depending therefrom. For the foregoing reasons, Applicants respectfully request reconsideration and withdrawal of the rejection to claims 1, 4, 8, 13, 16, 18, 21, and 26 under 35 U.S.C. §102(e) as being anticipated by Atkinson (U.S. 6,715,349).

V. Rejection of claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Atkinson in view of Dougherty

The Office Action rejected Claim 5 under 35 U.S.C. §103(a) as being unpatentable over Atkinson in combination with Dougherty et al. (U.S. 4,258,422). More specifically, the Examiner alleges that it would have been prima facie obvious to a person having ordinary skill in the art, with a reasonable expectation of success, to combine the fluid gauging systems and methods recited by Atkinson, with the capability to receive input file of height-to-volume values from a storage unit recited in Dougherty et al. to arrive at the applicant's claimed invention. Applicants submit that Atkinson and Dougherty et al, alone or in combination, fail to teach or suggest the claimed invention.

Claim 5 recites the method of Claim 1 (see above) wherein receiving tank geometry information includes receiving an input file of height-to-volume values from a storage device, *the height-to-volume values being obtained by incrementally slicing through a computer aided design model of the tank at a given attitude, each slice being providing an incremental volume of the tank.* (emphasis added) (see also Specification, p. 4, lines 22-25).

Dougherty (U.S. 4,258,422)

Dougherty teaches a liquid gauging system with a probe, where the probe produces a length signal dependent upon the length of the probe being immersed in liquid. (1:44-46). The

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system includes a storage apparatus for storing characterization parameters for determining liquid volume in a particular tank based on the length signal and characterization parameters. (1:47-52). Specifically, Dougherty teaches using an input of "total wetted sensing length versus volume" data to compute actual fuel quantity (8:66-9:7). The total wetted sensing length is the total signal obtained from the combination of all fuel gauge probes within in a fuel tank. (8:56-61).

Applicants respectfully submit that Dougherty does not disclose, teach, or fairly suggest a method wherein receiving tank geometry information includes receiving an input file of height-to-volume values from a storage device, *the height-to-volume values being obtained by incrementally slicing through a computer aided design model of the tank at a given attitude, each slice being providing an incremental volume of the tank.* Thus, neither Dougherty or Atkinson, either singly or in combination, discloses, teaches, or fairly suggests this additional aspect of the present invention.

For the foregoing reasons, applicants request reconsideration and withdrawal of rejection of claim 5 under 35 U.S.C. §103(a).

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CONCLUSION

For the foregoing reasons, applicant respectfully requests reconsideration and withdrawal of the rejections of claims 1-28. If there are any remaining matters that may be handled by telephone conference, the Examiner is kindly invited to call the undersigned at his convenience.

Respectfully submitted,

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Enclosures: New Drawing Sheet with New Figure 3

MAIL CERTIFICATE

I hereby certify that this communication is being deposited with the United States Postal Service via first class mail under 37 C.F.R. § 1.08 on the date indicated below addressed to: MAIL STOP AMENDMENTS, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

October 27, 2005
Date of Deposit

Wendy Saxby

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